

CLAIMS

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is as follows:

- 1    1. An arrangement for positioning an object relative to a surface comprising  
2                 a clamp structure,  
3                 a first actuator for applying a first clamping  
4                 force to said object,  
5                 means for producing a signal corresponding to  
6                 acceleration of an assembly of said object and said  
7                 surface, and  
8                 a second actuator for applying a second  
9                 clamping force to said object responsive to said  
10                means for producing a signal corresponding to said  
11                acceleration.  
12
- 1    2. An arrangement as recited in claim 1 wherein  
2                 said first actuator is a passive actuator.
- 1    3. An arrangement as recited in claim 1 wherein  
2                 said second actuator is a dynamic actuator.
- 1    4. An arrangement as recited in claim 2 wherein  
2                 said second actuator is a dynamic actuator.
- 1    5. An arrangement as recited in claim 2, wherein  
2                 said first force is a static force.

1       6. An arrangement as recited in claim 5, wherein  
2       said static force is sufficient to prevent relative  
3       motion of said object and said surface under an  
4       acceleration of at least 1G.

1       7. An arrangement as recited in claim 1, wherein  
2       said means for producing a signal corresponding to  
3       acceleration is an acceleration measurement device.

1       8. An arrangement as recited in claim 7, wherein  
2       said acceleration measurement device is an  
3       accelerometer.

1       9. An arrangement as recited in claim 1, wherein  
2       said means for producing a signal corresponding to  
3       acceleration is a motion control system.

1       10. An arrangement as recited in claim 1, wherein  
2       said second force is proportional to said  
3       acceleration.

1       11. An arrangement as recited in claim 1, further  
2       comprising  
3              a lever driven by one of said first actuator  
4              and said second actuator.

1       12. An arrangement as recited in claim 1, further  
2       comprising  
3              a plunger driven by one of said first actuator  
4              and said second actuator.

1       13. An arrangement as recited in claim 1, further  
2       comprising

3              a flexure having multiple degrees of freedom  
4       associated with one of said first and second  
5       actuators.

1       14. An arrangement as recited in claim 1, further  
2       comprising

3              means for moving said clamp structure along  
4       said surface into and out of engagement with said  
5       object.

1       15. An arrangement as recited in claim 1, wherein  
2       said clamp structure further comprises a vacuum  
3       hold-down arrangement.

1       16. A method of reducing forces applied to an  
2       object relative to a surface including steps of  
3              applying a first force to said object  
4       sufficient to prevent motion of said object on said  
5       surface when at rest,

6              applying a second force to said object  
7       corresponding to an acceleration of said surface.

1       17. A method as recited in claim 16, including the  
2       further step of measuring said acceleration of said  
3       surface.

1       18. A method as recited in claim 16, including the  
2       further step of predicting said acceleration of said  
3       surface.

1       19. A method as recited in claim 16, including the  
2           further step of

3               moving a clamp into or out of engagement with  
4           said object.

1       20. A method as recited in claim 16, wherein said  
2           second force reinforces said second force.

21. An apparatus comprising  
      a mount configured to receive an optical  
      element,  
      a holding element configured to hold the  
      optical element onto said mount,  
      a variable assist clamp configured to apply a  
      variable force to hold the optical element to the  
      mount, and  
      a control system, coupled to the mount and  
      configured to control the variable assist clamp such  
      that force applied by the variable assist clamp is  
      substantially commensurate with acceleration of the  
      mount.

22. The apparatus as recited in claim 21, wherein  
      the optical element comprises a reticle, mask, lens  
      or mirror.

23. The apparatus as recited in claim 21, wherein  
      the holding element comprises a chuck, reticle  
      stage, hard mount, flexured mount, clamp, flexured  
      clamp, spring preloaded clamp or a moving carriage.

24. The apparatus as recited in claim 21, wherein the mount comprises a chuck, reticle stage, hard mount, flexured mount, clamp, flexured clamp, spring preloaded clamp or a moving carriage.

25. The apparatus as recited in claim 21, wherein the variable assist clamp comprises a piezo electric actuator, bellows actuator, preload clamp spring, spring washer clamp, universal joint or 1DOF flexure in series with a preload spring or spring washer and a piezo-electric actuator or bellows actuator.

26. The apparatus as recited in claim 21, wherein the holding element applies a substantially static force to hold the optical element to the mount.

27. The apparatus of claim 21, wherein the variable clamp applies a dynamically variable force.

28. The apparatus as recited in claim 21, wherein the variable clamp applies a stepped clamping force to hold the optical element to the mount.

29. The apparatus as recited in claim 21, wherein the variable clamp applies a linearly variable clamping force to hold the optical element to the mount.

30. The apparatus as recited in claim 21, wherein the control system comprises an acceleration reporting device.